Environmental Science and Policy 91 (2019) 39–49

Contents lists available at ScienceDirect

Environmental Science and Policy

journal homepage: www.elsevier.com/locate/envsci

Designing collaborative governance: Insights from the drought contingency planning process for the lower Colorado River basin

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ARTICLE INFO

Keywords:
Environmental governance
Freshwater
Cooperation
Informal institutions
Trust

ABSTRACT

Agriculture, environment, industry, and millions of households in the western US and northern Mexico depend on the Colorado River, which is facing increasing water shortages due to climate change and rising demand. Collaborative governance will likely be key to solving allocation issues and achieving sustainable water use but has recently faced multiple challenges. This research integrates concepts from institutional, adaptive governance, and bargaining theories to analyze barriers and facilitators to collaborative governance in the drought contingency plan (DCP) process for the lower Colorado River basin from an Arizona stakeholder's perspective. The DCP is ultimately an effort to create a set of rules to prevent and address shortages in the basin. Through a content analysis of public meetings of the Central Arizona Project's governing board, we find a collective DCP or future related policy may be possible. But barriers to collaborative governance have intensified over time, hindering the process and making an agreement increasingly unlikely. The process is a perfect example of the interplay between rules and norms, and the issues that arise when norms underlying rules are interpreted differently. Our analysis provides insights for the design of collaborative water governance, including that conducting an analysis of power dynamics among the stakeholders would advance the DCP process. We ultimately argue that the Colorado River basin would benefit from a transition towards adaptive governance, and that our recommendations to improve collaboration are an important initial step. Additionally, our results reveal areas that require more empirical research, including understanding how to prepare for policy windows, rapid trust building among stakeholders, and theory building related to equity and marginalization in collaborative governance processes.

1. Introduction

The Colorado River in the western United States and northern Mexico is one of the most heavily regulated transboundary rivers in the world (Hundley, 2009). It has been over-allocated since 1922 when allocations among the seven US basin states were unintentionally formulated using overestimates of the total water volume (Castle et al., 2014). The basin has experienced several prolonged droughts in the past and has been in an extended drought since 2000 (Udall and Overpeck, 2017; US Department of the Interior, 2018). Further, projected temperature increases from climate change raises the probability of persistent multi-decadal "megadroughts" (Ault et al., 2016; Cook et al., 2015; Vano et al., 2013). More than one in ten Americans, including major metropolitan areas such as Denver, Las Vegas, Los Angeles, and Phoenix, rely on the Colorado River for municipal water (US Bureau of Reclamation, 2012). The current drought has tested the ability of existing use and conservation policies to meet the diverse needs of Native American Tribes, the environment, agriculture, municipalities, and industry.

Lake Mead is a critical reservoir on the Colorado River, supplying the lower basin with its allocation. The top of the reservoir, or the high-water line, is at approximately 1229 feet in elevation. This elevation refers to flood control and the reservoir is considered operationally full at 1219.6 feet in elevation. In early August 2018, Lake Mead's water elevation hovered around 1077 feet, substantially below operational capacity. Over the past five years, declining water levels in Lake Mead have propelled stakeholders in the upper (Colorado, New Mexico, Utah, Wyoming) and lower (Arizona, California, Nevada) basin states to recognize the urgent need to adapt current policies, but collaboration across and within the basin states to address these issues has been

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https://doi.org/10.1016/j.envsci.2018.10.011
Received 17 May 2018; Received in revised form 16 October 2018; Accepted 20 October 2018
Available online 28 October 2018
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halting. This article presents an analysis of an ongoing process to develop a lower basin policy to minimize the impacts of drought and avoid shortages within the entire basin.

Combining insights from institutional, adaptive governance, and bargaining theories, we address the following question: What are the barriers to collaborative governance identified in Central Arizona Project board meetings about the drought contingency planning process, and what opportunities do they reveal for strengthening collaborative governance efforts via improved practice and theory? The results provide insights for designing future collaborative water governance efforts in similar systems tackling social and environmental change and indicate areas to strengthen theory.

1.1. 2007 interim guidelines and the drought contingency plan

In 2007, under increasing concerns about water levels in Lake Mead and the basin, the seven basin states and the US Bureau of Reclamation finalized a policy detailing actions that would be taken in the event of shortage. This policy, the 2007 Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lakes Powell and Mead (referred to as the 2007 guidelines), defined a tier 1 shortage on Lake Mead as water level equal to (or below) elevation 1075 feet at the start of the water year (October 1) (US Bureau of Reclamation, 2007a). Shortages are determined through a 24-month ahead lead time study produced by the Bureau of Reclamation. In the event shortage is declared, the 2007 guidelines include water reductions to Arizona and Nevada; notably California did not participate in reductions in recognition of their senior priority to Colorado River water. The 2007 guidelines are in effect through 2026 and require reconsultation (updating) by December 2020 (US Bureau of Reclamation, 2007b).

The 2007 guidelines provide that if shortage is declared on Lake Mead, the Secretary of the Interior reserves the legal authority to act as necessary, reflecting the Secretary's authority as lower basin "water master" responsible for distributing all Colorado River water below Hoover Dam as designated by the Boulder Canyon Project Act of 1928. The broad provision in the 2007 guidelines that the Secretary "…shall evaluate and take additional necessary actions, as appropriate, at critical elevations in order to avoid Lower Basin shortage determinations as reservoir conditions approach critical thresholds…" introduces substantial uncertainty to potential consequences, including large-scale, involuntary water reductions (US Bureau of Reclamation, 2007b, p. 49US Bureau of Reclamation, 2007bUS Bureau of Reclamation, 2007b, p. 49). In 2016, Lake Mead's water level declined to elevation 1071 feet, and shortage declarations in October were narrowly avoided. Given the uncertainty related to federal intervention in an official shortage declaration, out of self-interest stakeholders initiated planning for a consensus shortage policy known as the drought contingency plan (DCP).

The DCP was initially conceived as a bridge between the enacted 2007 guidelines and the required reconsultation of those guidelines in 2020. The original goal was to negotiate voluntary water use reductions and conservation mechanisms (that would become mandatory after an agreement was finalized) at multiple scales across the basin states to avoid a shortage declaration on Lake Mead. The lower and upper basin states began separate DCP processes,

with the intention of consulting each other. Our analysis focuses on the lower basin DCP process, from Arizona's perspective. Although the US and Mexico have been involved in numerous bilateral collaborations, including the recently-finalized and implemented Minute 323 which includes drought planning (IBWC, 2017), the initial DCP is a unilateral process that stakeholders have stated is a priority to complete prior to initiating additional international agreements.

At the time of this writing, the lower basin DCP process is ongoing and an agreement has yet to be reached among the so-called "principals," stakeholders representing different interests (including the states and the Bureau of Reclamation). The stakeholders set a deadline of August 2018 to finalize the lower basin DCP (which has been pushed to January 2019). If an agreement is not reached, they have largely agreed to use elements from the ongoing DCP process to initiate the reconsultation of the 2007 guidelines. In August 2018, the Bureau of Reclamation declared there would be no official shortage for 2019 but projected over 50 percent probability of tier 1 or greater shortage 2020–2026, solidifying the importance of stakeholders continuing to work on a collaborative drought policy.

2. Theoretical framing

2.1. Successful collaborative water governance

We define collaborative governance as efforts to shape public policy or governance outcomes spanning multiple stakeholder groups, including local, state, and federal government, industry and agricultural representatives, non-profit and community-based organizations, and the public (Emerson et al., 2012; Hooper, 2005). Scholars have argued that collaborative, cross-scale governance is necessary for sustainable management of the Colorado River and other transboundary water systems (MacDonald, 2010; Wondolleck and Yaffee, 2000). However, research suggests that while collaborative governance is necessary, without active participation from stakeholders, collaborative governance is insufficient to ensure sustainable water management (Morris and de Loë, 2016). Stakeholders here refers to individuals and organizations that have an interest in, or are affected by, governance decisions (Reed et al., 2009). Coordination problems are common among bottom-up, collaborative approaches to river basin management (Cosens et al., 2014) and to improve the success of collaborative governance efforts in river basins, more empirical research is needed (Boone et al., 2017; Margerum and Whitall, 2004), particularly in areas such as how the design of collaborations influences outcomes (Porter and Birdi, 2018). Watersheds, as social-ecological systems that often span geographic areas and sociopolitical boundaries, are ideal cases for analyzing collaborative processes (Imperial, 2005). Some scholars have argued that the Colorado River basin is in an unprecedented period of collaborative governance (Fleck, 2016). The lower basin DCP is a recent effort to engage in collaborative governance to change institutions. Since its inception, the DCP process has faced multiple roadblocks and is a prime opportunity to analyze collaborative governance.

Institutional, adaptive governance, and bargaining researchers have identified key variables that influence the success of collaborative governance. Areas that remain poorly understood include the patterns and ways in which stakeholders collaborate (Bodin, 2017), how to maintain trust and legitimacy, and how to resolve coordination problems (Huitema et al., 2009). We integrate institutional, adaptive governance, and bargaining theories by examining concepts central to collaborative governance from each to illuminate both barriers to collaboration in the DCP process and areas that require further empirical research to improve collaboration. We selected these theories because their synthesis contributes to grey, or less theorized, areas Karpouzoglou et al. (2016). Institutional theory's focus on rules and norms that shape collaborative decision making is complemented by bargaining theory's focus on the concept of patience/urgency in decision making, which influences whether collaborative solutions exist. Adaptive governance theory's strength in unpacking complex dynamics of governance systems across scales complements institutional theory's competence in assessing weaknesses in existing institutions that hinder collaboration.

2.2. Institutional theory

The Institutional Analysis and Development framework is based on insights from hundreds of natural resource management case studies (Ostrom et al., 1994). The central component of the framework is the "action arena" where actors engage in decision making processes that shape system outcomes and are influenced by exogenous factors.

Insights produced using the framework have contributed to theory-building on successful collaborative governance of natural resources (e.g., Clement, 2010; Imperial, 1999). The general framework for analyzing the sustainability of social-ecological systems built upon Ostrom and colleagues' research to produce a more comprehensive set of factors influencing self-organization and collective action for sustainable environmental governance (Ostrom, 2009). These frameworks and related theory (e.g., Anderies et al., 2004; Wilson et al., 2013) posit that factors that influence the initial organization of and ongoing collaborative governance include: clearly defined system boundaries; clear and accessible conflict-resolution mechanisms; trust and continuous trust building; a balance between transparency and the burden of fulfilling public roles; consistent, high-quality information sharing; nested spatial scales for large systems; ongoing perception of harm or risk with inaction; reliance on the natural resource being governed; opportunities to communicate; addressing power dynamics between actors, especially in terms of access to knowledge and decision making; and internal (as opposed to external) sanctions for violating trust and other norms (Bryson et al., 2006; Innes and Booher, 1999; Lejano and Ingram, 2009; Lubell et al., 2007; Ostrom, 2000, 2005; Vallino, 2014). Presence of these factors has been associated with lower transaction costs and less reliance on costly sanctioning for rule violations (Ostrom, 2005).

The concept of polycentricity is also important to institutional theory related to collaborative governance (Ostrom, 2010). Polycentric systems have multiple, independent, but coordinated, centers of decision making (Pahl-Wostl et al., 2012). In a comparative analysis of 29 river basins, Pahl-Wostl et al. (2012) found that polycentric governance structures promoted innovation and flexibility necessary to address uncertainties that accompany climate change in river basins. We return to the concept of polycentricity in the Colorado River basin in the discussion.

2.3. Adaptive governance theory

Adaptive governance has roots in and many synergies with institutional scholarship and the bodies of research frequently inform each other (e.g., Dietz et al., 2003; Scholz and Stiftel, 2010). The terms "adaptive governance" and "collaborative governance" are sometimes used interchangeably, but here we make a distinction between the concepts. Specifically, adaptive governance involves three primary elements: self-organization via formal and informal networks, social learning, and emergence of the governance process itself (Cosens et al., 2018). Some adaptive governance research has taken a broader approach, including scholarship from new governance (Lockwood et al., 2010) and collaborative approaches to governance under the adaptive governance umbrella (Cosens et al., 2018).

Transboundary river basins are characterized by high levels of uncertainty, difficulty controlling experimentation, and competing interests. Thus, they benefit from adaptive governance which incorporates accountability for setting goals and experimentation (Akamani and Wilson, 2011; Raadgever et al., 2008; Cosens et al., 2018). However, more research is needed to understand how diverse management processes and strategies either hinder or aid a transition to adaptive governance. In this research we focus on collaboration as a prerequisite of adaptive governance (Folke et al., 2005) and a critical component of environmental governance across scales and stakeholder types. Given that "collaboration is at the heart of adaptive governance" (Kallis et al., 2009), adaptive governance research provides unique insight on several factors that contribute to the success or failure of collaboration, either as part of engaging in adaptive governance or to influence other collaborative approaches. These include efforts to work across and within scales, institutional flexibility, trust and legitimacy, scale-matching, managing threats to the process, and access to financial resources (Abrams et al., 2015; Berkes, 2002; Chaffin et al., 2014; Childs et al., 2013; Goldstein, 2008; Innes and Booher, 1999).

2.4. Bargaining theory

We employ bargaining theory's emphasis on urgency and shared interests to understand whether a collective solution is likely in the DCP case over time, based on sense of urgency as a barrier to collaboration. Institutional research has been critiqued for focusing on local rules of small-scale systems while ignoring wider processes (Clement, 2010). Institutional frameworks have frequently been applied to smaller-scale systems and large scales often pose divergent challenges to collaborative governance (Kallis et al., 2009; Ostrom, 2009). Applying institutional theory in such situations may incorrectly lead to the assumption that a collective choice solution is possible where instead external intervention may be a feasible solution based on the context and normative goals of the system's stakeholders. Bargaining theory, a type of game theory, seeks to address whether a bargained, collective choice solution can be reached in situations where parties would mutually benefit from cooperating but have conflicting interests and considerations related to their positions (Muthoo, 1999). In myriad bargaining situations, agreements are never achieved, or are only achieved after damaging delays (Carraro et al., 2007). Factors relevant to bargained collaborative solutions include shared interests and motivations, patience or urgency, sense of risk or risk aversion, and level of information asymmetry (Muthoo, 1999).

2.5. Windows of opportunity

Finally, we introduce the concept of "windows of opportunity" from policy sciences (Kingdon, 1984). A window of opportunity is associated with accomplishing specific political or social goals and typically occurs during moments such as political elections or crises like natural disasters. However, identifying a window anteriorly or during its occurrence is challenging (Huitema and Meijerink, 2010; Olsson et al., 2006). Noteworthy gaps in environmental governance research are an understanding of how to recognize and exploit windows of opportunity (Chaffin et al., 2014).

3. Overview of the central Arizona project

Most historical conflicts related to water allocation in the Colorado River basin have been connected to lower basin states (e.g., Cortinas et al., 2016; Patashnik, 2014). Considering such conflicts and the greater demand for Colorado River water in the lower basin (Rajagopalan et al., 2009), the lower basin DCP process is arguably more complex than efforts in the upper basin. We focus on the lower basin DCP process primarily from the perspective of a key stakeholder, the governing board of the Central Arizona Project (see Section 4. Methods).

The Central Arizona Project is a 335-mile (539.1 km) aqueduct with the capacity to transport 1.5 million acre-feet of Colorado River water annually. It is the largest, most expensive water transportation project in US history and pumps Colorado River water uphill nearly half a mile in elevation (2400 feet; 731.5 m) to reach its terminus in southern Arizona (CAP, 2018) (Fig. 1). See Coate (1995), Hanemann (2002), and Hirt et al. (2008) for more background on the Central Arizona Project.

In 1971, the Central Arizona Water Conservation District (CAWCD) was created to market Central Arizona Project water. Funds from sales to urban and agricultural users repay the federal debt from the aqueduct's construction (approximately $2.1 billon). Although demand for water was initially sluggish as the marginal cost of Central Arizona Project water could not compete with groundwater prices (Bush and Martin, 1986; Martin, 1988), many stakeholders in Arizona now rely on this water to avoid excess groundwater pumping (as restricted by the 1980 Groundwater Management Act). Thus, CAWCD, the Central Arizona Project's governing board, has come to play a unique and important role in Arizona water management (Blomquist et al., 2010).

Over 2017 and 2018, tensions between CAWCD and, seemingly, all

Fig. 1. U.S. Colorado River basin boundaries and Central Arizona Project location (white line). The inset shows the Colorado River basin in the context of the U.S.

other upper and lower basin stakeholders have risen. This tension is related to DCP, but also more broadly to CAWCD's water management choices and the perception among other stakeholders that CAWCD has been manipulating the system as they optimize water use for Arizona (Runyon and Jaspers, 2018). Some stakeholders' perceptions on collaboration, the drought plan, and CAWCD's role were made public in dueling newspaper editorials from CAWCD board members (Taylor and Arboleda, 2017) and the director of the Arizona Department of Water Resources (Buschatzke, 2017). The public airing of these views appeared to be an important violation of informal norms of collaboration among the lower basin stakeholders. Much of the frustration around this time and into 2018 stemmed from a mandate in the 2007 guidelines that states that if Lake Mead is above elevation 1105 feet, the lower basin receives a normal release of 8.23 million acre-feet from Lake Powell. But when Lake Mead is between elevation 1076 and 1105, the lower basin receives a release of 9 million acre-feet from Lake Powell. Savvy stakeholders in Arizona noted this, which created an incentive for Arizona to ensure Lake Mead's elevation remains between elevation 1076 and 1105 feet to receive above normal releases from Lake Powell. Additionally, an ongoing controversy related to CAWCD's

Table 1
Selected codes organized by primary theoretical source.

Deductive code	Primary influencing theory
Collective choice rules	Institutional
Perception of harm with inaction	Institutional
Institutional flexibility	Adaptive governance
Systems thinking	Adaptive governance
Efforts to work across scales	Adaptive governance, institutional
Inclusion of other actors	Adaptive governance, institutional
Patience or urgency	Bargaining
Capacity influenced by financial resources	Bargaining
Shared interests and values	Bargaining, institutional
Information asymmetry	Bargaining, institutional
Uncertainty	Adaptive governance, bargaining, institutional
Reliance on the natural resource	Adaptive governance, bargaining, institutional
Knowledge of the social-ecological system	Adaptive governance, bargaining, institutional
Trust	Adaptive governance, bargaining, institutional
Openness of actors to new ideas	Adaptive governance, bargaining, institutional

claims of sovereign immunity under the 11th amendment of the US constitution has ignited arguments. Essentially, CAWCD has appeared to assert that they are an arm of the state with rights for policymaking and negotiating. These issues have compounded such that CAWCD has become increasingly isolated from other stakeholders and the upper basin released a public statement condemning, and attempting to shame, CAWCD for violating norms associated with cooperation (Upper Colorado River Commission, 2018). These tensions increased and permeated relationships throughout the DCP planning process.

4. Methods

Throughout 2015 to mid-2018, the majority of the DCP planning process was not publicly accessible. The public portions of the monthly CAWCD meetings are the most comprehensive, regular, publicly accessible source of information from a principal stakeholder involved in the lower basin DCP process. The statements made by board members and other participants during the public meetings are part of the public domain and subject to Arizona's open meeting law, and as such there is no expectation of confidentiality. Because this analysis focuses on broader patterns, we do not identify quotes by individuals, but by stakeholder group (e.g., agricultural stakeholder). Board meetings transcribed for this analysis can be viewed here: http://www.cap-az.com/board/meetings. CAWCD meetings follow Robert's rules of order for parliamentary procedure and during meetings stakeholders that wish to speak may submit a card and make a comment to the board. As a result, the board meetings include a diversity of perspectives on the DCP process, including from the Arizona Department of Water Resources, Native American Tribes, municipalities, and irrigation districts. Although the perspectives of California, Nevada, and upper basin stakeholders are occasionally referenced, the meetings center on Arizona perspectives. Thus, a limitation of this analysis is the incompleteness of the perspectives analyzed. Further, the nature of the dataset as public meeting archives resulted in data that are biased based on who had access to, and who was excluded from, the public meetings. While the meetings were formally open to any interested individual or group, they were largely held in the Phoenix, Arizona area and during multiple meetings, stakeholders mentioned traveling several hours to attend and have their voice heard. This was disproportionately mentioned by participants traveling from relatively remote Native American reservations in other parts of Arizona. Efforts were made to allow stakeholders to participate remotely, via teleconferencing, but it must be acknowledged that some interested stakeholders were likely excluded based on socio-economic variables that influence the ability to access either equipment or phone/internet connections required to participate remotely. The dataset included fewer perspectives from members of the public and Native Americans. Thus, another limitation of the analysis is the unequal representation of perspectives from these groups, which has implications for factors that influence collaboration.

We employ content analysis (Bernard et al., 2016) to analyze transcripts of publicly-available, video-recorded CAP board meetings from January 2016 to April 2018. We refer to seven separate periods during this time: early 2016, 2017, and 2018 (January – April), mid 2016 and 2017 (May - August), and late 2016 and 2017 (September – December). Stakeholders most often refer to CAWCD as the "CAP [Central Arizona Project] board," thus, **we use the term "CAP board" in the analysis to refer to CAWCD**. The meeting portions discussing the DCP were transcribed and transcripts were coded at the sentence level with deductive codes developed from a literature review, and inductive codes developed with familiarity with the dataset (Fereday and Muir-Cochrane, 2006). The literature review to develop deductive codes was systematic and targeted, not comprehensive. We searched Web of Science for review articles related to each theory to gather a wide array of concepts. This began by searching with combinations of one theoretical term (adaptive govern*, bargaining*, institution* theory) and a variation on collaboration (collaborat*). We refined these results to peer-reviewed empirical or theoretical studies that focused on collaborative natural resource governance and we specifically sought review or synthetic articles. We then created deductive codes based on lists of concepts from each theory (Table 1). We ultimately had several codes that were removed during codebook development as they were not present in our dataset (e.g., stakeholders discussing constitutional rules or scale mismatch). Inter-rater reliability is a measure of the validity of codes (Bernard et al., 2016). Cohen's kappa is a standard measure of inter-rater reliability and was calculated for each code with two coders on three randomly selected transcripts; 0 indicates perfect disagreement, 1 indicates perfect agreement. Cohen's kappa is considered unreliable for rare findings and it is often very low (less than 0.1) for rare observations (Viera and Garrett, 2005). In these cases, it is helpful to report both the percentage agreement between coders and the kappa value. However, we did not have any cases where kappa was initially lower than 0.5. If initial agreement (kappa) was less than 0.7, instances of disagreement were discussed and codes were revised.

Pahl-Wostl et al. (2012) lament that water governance researchers have often offered overly simplistic panaceas as recommendations to implement sustainable management without empirically testing their fit with diverse contexts. We recognize that our analysis is contextualized in the Colorado River basin and without comparative analyses, our findings and recommendations are primarily applicable to the Colorado River basin and basins with similar social-ecological contexts. However, our methodology using publicly accessible recordings of an ongoing process to provide real-time scientific analysis is transferrable to collaborative environmental governance issues in diverse contexts.

5. Emerging barriers and bridges to collaborative governance in the DCP process

We identified multiple elements central to successful collaborative governance, including efforts to work across scales, institutional flexibility, and perception of harm with inaction, in the early DCP planning phase. A window of opportunity opened in mid-2015 as Lake Mead declined to 1074.71 feet, and in 2016 stakeholders worked on the DCP with a sense of urgency. However, the window closed as new and ongoing conservation efforts contributed to Lake Mead's gradual increase. We found that throughout 2016 and into 2017, distrust among the stakeholders within Arizona and across the lower basin increased, and the sense of importance and urgency among stakeholders to finalize the DCP declined. Stakeholders in the CAP board meetings expressed

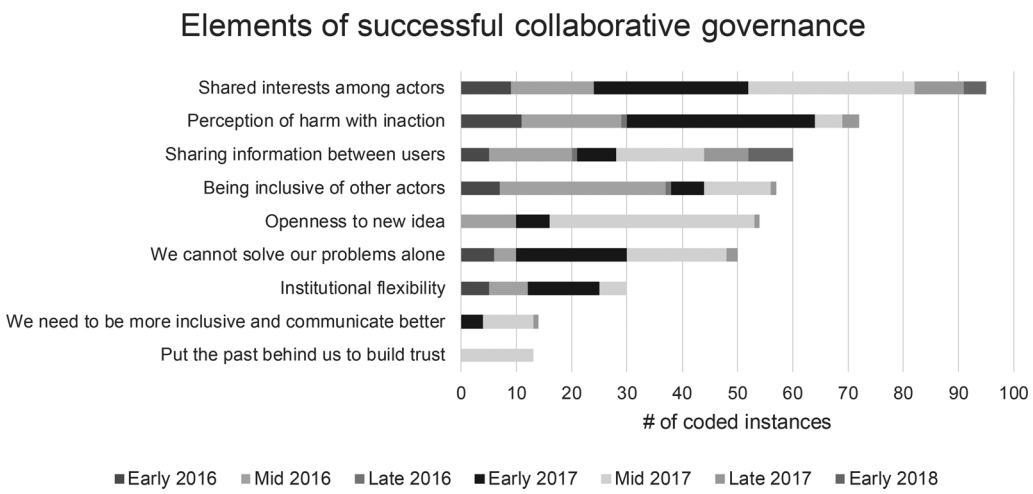
Elements of successful collaborative governance
Shared interests among actors
Perception of harm with inaction
Sharing information between users
Being inclusive of other actors
Openness to new idea
We cannot solve our problems alone
Institutional flexibility
We need to be more inclusive and communicate better
Put the past behind us to build trust
0 10 20 30 40 50 60 70 80 90 100
# of coded instances
Early 2016 Mid 2016 Late 2016 Early 2017 Mid 2017 Late 2017 Early 2018

Fig. 2. Elements of successful collaborative governance. The number of sentences (the level at which each document was coded) is roughly equal in each time period, with mid-2016 an outlier (more sentences). However, when density measures (coded instances/sentences in time period) are used, the same patterns appear.

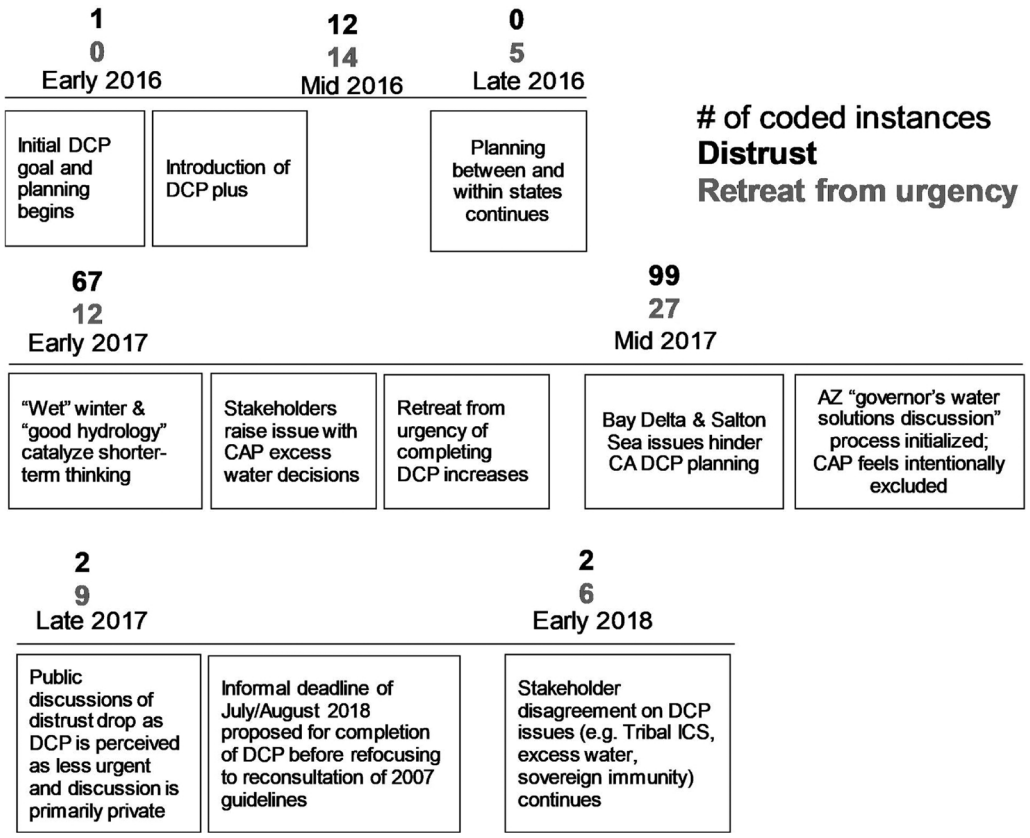
1
0
Early 2016
12
14
Mid 2016
0
5
Late 2016
Initial DCP goal and planning begins
Introduction of DCP plus
Planning between and within states continues
# of coded instances
Distrust
Retreat from urgency
67
12
Early 2017
99
27
Mid 2017
"Wet" winter & "good hydrology" catalyze shorter-term thinking
Stakeholders raise issue with CAP excess water decisions
Retreat from urgency of completing DCP increases
Bay Delta & Salton Sea issues hinder CA DCP planning
AZ "governor's water solutions discussion" process initialized; CAP feels intentionally excluded
2
9
Late 2017
2
6
Early 2018
Public discussions of distrust drop as DCP is perceived as less urgent and discussion is primarily private
Informal deadline of July/August 2018 proposed for completion of DCP before refocusing to reconsultation of 2007 guidelines
Stakeholder disagreement on DCP issues (e.g. Tribal ICS, excess water, sovereign immunity) continues

Fig. 3. Timeline of DCP related events overlaid with coded instances of distrust between stakeholders and retreat from the urgency of completing the DCP.

shared interests in protecting Lake Mead and the Colorado River, but this issue was also a frequent source of conflict. Overall, several patterns in barriers to a collaborative DCP process emerged that provide insight for future efforts.

5.1. Early DCP process

Through 2016 and into early 2017, elements important to successful collaborative governance were present, and in several instances prominent (Fig. 2). For example, perception of harm with inaction, in this case to Lake Mead and the Colorado River, peaks in early 2017 and declines after. This perception of harm with inaction propelled by the decline of Lake Mead to its lowest level since its creation catalyzed extended conservation efforts by the CAP board and other stakeholders. This decline in the perception of harm as Lake Mead's elevation incrementally increased over 2017 had consequences for the DCP process. Without heightened risk perception, stakeholders are less likely to address environmental governance issues like climate change or drought planning (Lubell et al., 2006; Niles et al., 2013; O'Connor et al., 1999).

Other factors that were present in the initial planning stages that declined over time include being inclusive of other actors, openness to new ideas, and shared interests. Instances of stakeholders being inclusive of other actors in the DCP process (for example, inviting them to additional DCP meetings) occurred 30 times in mid-2016; those

instances declined 60 percent by the end of 2017. Stakeholders also expressed the most openness to new ideas during initial planning (peaking in mid-2017), but this trait dwindles after mid-2017. Stakeholders identified and discussed shared interests more frequently in the initial planning stages, with a peak in early to mid-2017. Additionally, efforts to work across social and geographic scales (e.g., the upper and lower basin, or among Arizona stakeholders) were present throughout the entire time period but were most prominent in earlier stages.

As stakeholders began to openly recognize and discuss issues related to trust and information sharing, efforts by the CAP board and other stakeholders to be more inclusive emerged in 2017. When conflicts between stakeholders increased, some stakeholders (including certain CAP board members) acknowledged that problems related to Lake Mead, the Colorado River, and drought could not be solved alone. As indicators of success were declining or plateauing, barriers, such as distrust, were increasing.

5.2. Barriers to collaborative governance emerge and increase

Over time barriers to completing the DCP emerged or became increasingly prominent, including a retreat from the urgency of completing the DCP, distrust between stakeholders, and short-term thinking, particularly in relation to weather versus climate (Fig. 3).

5.2.1. Retreat from urgency

During the nascent stages of the DCP process, CAP board members and other Arizona stakeholders were committed to completing the DCP as quickly as possible. In fact, in December 2016 and January 2017, there was discussion among the CAP board and staff of securing the required state legislative approval for Arizona to participate in the lower basin DCP. However, Lake Mead elevation slowly climbed, and CAP board members began to observe the initial results from their recently intensified conservation efforts. The winter of 2016–2017 brought increased precipitation in the upper basin, bringing a year of so-called "good hydrology." These factors combined to close the window of opportunity. With this closure, stakeholders including certain CAP board members/staff and agricultural representatives, shifted from their initial goal of quickly completing and enacting a DCP for the lower basin.

This retreat from the initial sense of urgency peaked in mid-2017. For example, at a June 2017 board meeting, CAP and other stakeholders described their conflicting views on when and how the DCP should be completed.

> "Personally, I don't see the urgency behind some of the conversations that are taking place." CAP board member, June 2017.
> "Just a year ago your staff was advocating to put DCP into place, time was of the essence." Municipal stakeholder, June 2017.
> "…rather than rushing headlong into outcomes that are needlessly expedient, to not have the benefit of careful consideration that they require." CAP board member, June 2017.
> "Now the pendulum has swung from action must be taken immediately to a message that we don't understand why the state is pushing these issues so fast," Municipal stakeholder, June 2017.

Later in 2017 and early 2018, CAP board members and staff continued to discuss delayed timelines and alternatives to DCP if it remained incomplete. CAP board meetings indicated that deliberations among the principals stalled multiple times in 2017. Many factors, including stakeholders' diminished perception of risk and retreat from urgency, indicate the window of opportunity for implementing a lower basin DCP passed. Without the immediate sense of risk, and increasing levels of distrust among the stakeholders, the potential for successful collaborative governance is diminished.

5.2.2. Increase in distrust

Distrust among stakeholders peaked simultaneously with stakeholders' retreat from the urgency of completing the DCP. Non-CAP board stakeholders expressed frustration and distrust stemming from perceived changes in the CAP board's DCP position. Additionally, related issues regarding the governance of the Central Arizona Project emerged and were highlighted negatively in the news media in early 2017 (e.g., the CAP board's excess water use decisions, sovereign immunity issues, argumentative editorials). During this time, CAP board members expressed an increasing sense of distrust and, in particular, a perception that other stakeholders were deliberately misrepresenting CAP board positions on the DCP. A CAP board member conveyed tension between a desire to be collaborative and feeling frustrated and distrustful.

> "So yes, let's look ahead, let's do it right, let's make sure that our intent to be cooperative is made manifest but I think also for other folks who are trying to criticize us, they owe everybody the same courtesy to come forward with any questions that they may have and not to raise them in court before they discussed them and tried to resolve them otherwise." CAP board member, June 2017

As distrust among the stakeholders increased in mid-2017, a new theme emerged, with CAP board members repeatedly asserting that CAP would not be controlled by others in their considerations of the DCP or related issues. For instance,

> "And to the extent the executive branch or the feds want to wander into this, that's fine, but real men have power plants and ditches and if you don't have one of those then you can take your shiny little silver bucket down to the Colorado River and you can carry it into Phoenix." CAP board member, June 2017
> "I did not work hard to hand my responsibilities over to another agency. That would be inappropriate and it would be irresponsible…I want to make clear that this director feels very strongly that we will not take direction and be in full alignment with any organization." CAP board member, June 2017

Throughout 2017, several stakeholders, including the CAP board, municipalities, and Native American communities, articulated frustration with a lack of transparency surrounding the DCP process and feelings of exclusion. CAP board members expressed that they were not involved in DCP discussions in early 2017, but the Arizona Department of Water Resources had a different perspective.

> "We weren't in the room." CAP board member, February 2017.
> "There wasn't anything that CAP didn't know about that was being discussed between DWR and Reclamation." ADWR representative, February (2017).

Native American Tribal representatives, including the Tohono O'odham Nation and Gila River Indian Community, succinctly conveyed their own frustrations with the DCP process.

> "Tribes were not consulted one bit on the DCP." Tohono O'odham Nation Representative, June 2017

In a letter to the CAP board in June 2017, the Governor of the Gila River Indian Community expressed frustration at not being able to participate in discussions.

> "…this board meeting appears to have been hastily arranged, without prior consultation on schedules and I am unable to change my schedule…As an entity with both a Colorado River water entitlement and entitlements from other water systems, the Community has a unique perspective on this need for coordination."

There are endless accounts of inaccurate representation, exclusion, and mistreatment of indigenous communities in natural resource issues, and the unresolved water rights of multiple Native American Tribes within the Colorado River basin is a prime example (Cordalis and

Cordalis, 2014). Native American communities in Arizona and the Colorado River basin not only rely on Central Arizona Project water, but substantially contribute to water conservation efforts in Arizona and elsewhere. For collaborative governance efforts in the basin to be sustainable, stakeholders in Arizona and throughout the basin must be actively inclusive of all stakeholders, including Native American communities.

5.2.3. Short-term thinking

After continuing to decline throughout 2015 and 2016, increased winter precipitation in 2016–2017, combined with ongoing conservation efforts, raised Lake Mead's elevation to 1089 feet in March 2017. After the period of increased precipitation in early 2017, evidence of short-term thinking related to the DCP emerged. In 2017, there were numerous instances of stakeholders planning or making decisions based on weather, as opposed to climate.

> "My thought is that we leave out one element in all of this and that is - right now we're hopeful that the weather will solve our problems at least for a couple of years - we're looking out two years at a time, three years at a time..." Agricultural district representative, January 2017
>
> "This wet winter has fundamentally changed the landscape." CAP board member, February 2017.
>
> "Today the goals as we understand them, again because the reservoir is in a better position than it was in 2015, is to avoid shortage as long as possible, again mitigating the disparate effects of DCP, having a program that reflects the changes in hydrology." CAP staff member, August (2017).

Beneficial hydrologic conditions lulled stakeholders into a sense of security and short-term thinking corresponded with a retreat from the urgency of completing the DCP. Given that climate change in the Colorado River basin is projected to increase the severity and frequency of droughts (Udall and Overpeck, 2017), it is inappropriate for positive hydrologic conditions for a few months or years to influence water management and drought planning. Some stakeholders have clearly acknowledged this and in multiple instances in 2017, there was a deep divide among CAP board members on issues of short-term thinking and weather versus climate. For example, one CAP board member expressed concern that short-term thinking damaged the board's credibility.

> "We don't have the official shortage called, but shortage is here. If shortage were not here, we wouldn't be doing all the things we've been doing…I sometimes feel like we've run around a bit saying 'Penny, Penny the sky is falling,' we've got to do all these things but we're making people a bit complacent by constantly, it's going to happen next year, it's going to happen next year, it's going to happen next year." CAP board member, August 2016

This tension between stakeholders indicates that there are opportunities to foster long-term, anticipatory thinking among the stakeholders, if not for the DCP, then for future efforts.

5.2.4. Violation of social norms

The finding that the CAP board was violating social norms associated with expectations of cooperation in the Colorado River among upper and lower basin stakeholders (Fleck, 2016) was an inductive result. From the upper basin's perspective, the CAP board was violating norms of cooperation underlying the upper basin's interpretation of the 2007 guidelines. Namely, the upper basin believes that because the Colorado River basin is in an extended drought and facing shortages, the CAP board should not optimize their own water needs but acquiesce to protect Lake Powell. From the CAP board's perspective, they have done nothing legally wrong and are simply adhering to the 2007 guidelines to optimize water deliveries for stakeholders within Arizona. Interestingly, some CAP board members were aware that their actions were being perceived as norm violations by the upper basin.

> "I feel like maybe the upper basin as we're talking about these things, the upper basin was, is, expecting a certain mode of behavior by us and if we, if we're looking at releases from Powell and how that changes our mind about how we behave, has that been communicated to them?" CAP board member, March 2017.
>
> "I don't want to be seen as gaming the system…I think there's certain expectations about how we were going to move forward in a shortage…" CAP board member, March (2017).

Next, we turn to the implications of these barriers for the DCP and future collaborative efforts.

6. Insights for designing collaborative governance

At the time of writing, the lower basin DCP process has yet to achieve its goals, but our analysis reveals that there are multiple opportunities to integrate elements known to foster successful collaborative governance into current planning. Our recommendations include monitor and exploit windows of opportunity, build trust specifically via more inclusive and representative policy processes, address power dynamics among the stakeholders, address short-term thinking specifically among Arizona agricultural stakeholders, and capitalize on recent statewide recognition of the informal institutions that shape expectations for collaboration within Arizona and the Colorado River basin. We ultimately argue that the Colorado River basin would benefit from a transition towards adaptive governance, and that our recommendations to improve collaboration are an important initial step.

6.1. Using theory to identify and exploit windows of opportunity

Our analysis identified a window of opportunity in 2016 that was tied to declining Lake Mead elevations and perceived harm associated with inaction. Although perception of harm with inaction has been examined in instances of environmental governance, we recommend integrating it explicitly into institutional analyses to aid identifying windows of opportunity. Norms that shape variables like risk perception influence collective action but are often ignored in analyses of rules (Helmke and Levitsky, 2004; Williamson, 2009). Windows of opportunity are difficult to identify while they are occurring (Michaels et al., 2006) but another window may be rapidly approaching with the increasing probability that official shortage will be declared on the Colorado River in 2020. Considering windows in diverse contexts are often catalyzed by similar types of events (such as natural disasters or major elections), stakeholders involved in the DCP process may continue carefully observing Lake Mead elevations and be prepared to act if other stakeholders' urgency and political will returns with declining water levels.

Our analysis found that representatives of Native American Tribes often felt excluded from the DCP process and that members of the public were often absent from it. Based on the uneven inclusion and participation of these groups and others (e.g., expressed power imbalances between municipalities and agriculture), to be prepared to act during a window of opportunity it will be crucial to conduct an analysis of status quo power dynamics and discuss goals for implementing change. Without an understanding of who holds power related to decision-making and how power is perceived, efforts to achieve collaborative governance may fail even during a window of opportunity (Armitage, 2008; Chaffin et al., 2014). Addressing power dynamics is likely to increase trust among stakeholders and perceived legitimacy of the DCP, which is linked to successful collaborative water governance (Cosens and Williams, 2012).

It is historical precedent that major Arizona water decisions have been reached during windows of opportunity catalyzed by external pressure. For example, without action during a window of opportunity, it has been argued the seminal 1980 Arizona Groundwater Management Act would never have been implemented (Connall, 1982). If

stakeholders fail to prepare for and recognize a window of opportunity, achieving a collaboratively created DCP may not be feasible. Whether a window of opportunity can be taken advantage of without prior preparation or how to best prepare to take advantage of a window to move towards collaborative governance are poorly understood areas. We echo calls for more empirical research on windows of opportunity in water governance (Chaffin and Gosnell, 2017), but we argue that assessing power dynamics in preparation to act is a promising starting point.

6.2. Building trust and inclusion

Distrust was centered on not being included and meetings occurring "behind closed doors." Although private, closed meetings can improve performance by providing some stakeholders with a safe space in which they do not have to perform a set of expectations and roles for the public or other stakeholders, such meetings risk alienating those excluded (Fuller, 2009; Wutich et al., 2010). As there is evidence of the latter occurring, stakeholders involved in the DCP should be cognizant of how closed-door meetings are organized and their impact on the overall collaborative process and goals. The DCP or reconsultation of the 2007 guidelines (whichever comes first), are ideal opportunities for stakeholders at all levels (state, city, etc.) to strive to be more inclusive and build trust. Focusing on shared accomplishments among stakeholders, and being inclusive of all stakeholders in acknowledging them, can deepen trust in the overall collaborative process (Ansell and Gash, 2008; Stern and Coleman, 2015). Finally, to improve the success of collaborative water governance, our findings indicate a need for more empirical research on rapid trust building in cases where it has deteriorated to prepare to act during windows of opportunity.

6.3. Conflict resolution mechanisms

A collaborative bargaining solution may exist in the DCP process as it does not appear any stakeholder could be better off in the medium or long term (years or decades) if it exited the DCP negotiations (Muthoo, 1999). If efforts to plan for water use in times of drought ceased and Lake Mead's water level continued to decline (or dropped below 1025 feet), everyone would lose access to this key resource for which few viable substitutes exist. Thus, each stakeholder benefits at some level from participating in DCP negotiations. During the DCP process, Arizona stakeholders reported more conflicts than shared interests. Despite this, the continued discussion of shared interests over time indicates the potential for working towards common goals. Conflicts often stemmed from differing values, including economy and intergenerational welfare. Conflict resolution mechanisms are vital to supporting collaborative agreements when stakeholders possess conflicting values.

In the current DCP process, conflict resolution mechanisms are unclear to stakeholders or costly (e.g., court cases), and less-costly mechanisms are often lacking. Conflict resolution mechanisms can include options like external mediators that stakeholders consult or court systems, but low-cost mechanisms are more enduring and access to only costly mechanisms can harm robust institutional arrangements (Cox et al., 2010; Ostrom, 2005). In a case of Mississippi River management, participatory management and experiments with stakeholders discussing potential conflicts with an external party resulted in fewer conflicts and helped build trust among stakeholders (Costanza and Ruth, 2001). In future drought planning efforts, stakeholders should develop or identify clear, low-cost conflict resolution mechanisms and ensure they are available to all stakeholders.

6.4. Address short-term thinking

Environmental governance benefits from adaptive, anticipatory thinking, and considerations of decisions on inter-generational time scales (Boyd et al., 2015). During the DCP process, short-term thinking was prevalent, especially among agricultural and home-building stakeholders. The Colorado River basin would benefit from stakeholders embracing adaptive thinking. This includes considering inter-generational equity, the availability of water for the environment, and the projected impact of environmental changes. Implementing these considerations requires the capacity to act. Stakeholders often discussed uncertainty in their decision-making processes due to a lack of capacity associated with the uncertainty of funding (from either federal or other sources). This must also be addressed to improve the capacity to achieve collaboration and eventually adaptive governance.

6.5. The importance of informal institutions

The ongoing conflict surrounding the CAP board's decision to maximize releases from Lake Powell between the CAP board and other basin stakeholders is a perfect example of the interplay between rules and norms, and the issues that arise when norms underlying rules are interpreted differently. If stakeholders recognize their missteps (such as either intentionally or unintentionally using water in a way that violated social norms), and organizations subsequently identify the need for cultural change that adheres to social norms, they provide an opening to change governance processes. The openness of some CAP board members to changing the norms within CAP provides the possibility that the CAP board and other stakeholders may work together to generate cultural change that supports collaborative governance. Indeed, after collaboration is achieved as a precursor to adaptive governance, we argue that the Colorado River basin, as a system facing myriad uncertainties, would benefit from transitioning to adaptive governance. Such a system would focus on developing the capacity to evolve in response to uncertainty and achieve states that are desirable for both people and the remainder of the environment, such as sustainable management of water resources (DeCaro et al., 2018).

Colorado River basin management is largely decentralized, with multiple levels of government and other stakeholders involved in water infrastructure, delivery, and treatment. At several points in recent history, Colorado River governance could be characterized as polycentric (Pahl-Wostl et al., 2012). However, the recent conflicts among stakeholders within the lower basin (and between the lower and upper basin) have violated the informal norms associated with trust and cooperation, affecting coordination efforts across the basin. Thus, current basin governance may be characterized as decentralized and uncoordinated, but not polycentric. Decentralized but uncoordinated governance is often associated with fragmentation, isolation, and decreased social-ecological performance (Pahl-Wostl et al., 2012). Fragmentation can be reduced by strengthening coordination, in which strengthening trust and conflict resolution is critical. Whether polycentricity supports collaboration and coordination also depends on the power dynamics within that system (da Silveira and Richards, 2013), so here again, realizing collaboration will benefit from an analysis of power dynamics. Additionally, to address both how rules and norms should change to facilitate sustainable water governance and the rules that define how existing rules can be changed, water governance scholarship necessitates amplified integration of legal and social science fields.

7. Conclusion

Integrating concepts from institutional, adaptive governance, and bargaining theories, we analyzed the DCP process for the lower Colorado River basin from an Arizona stakeholder's perspective. We suggest a collective solution may still be possible, but that numerous barriers to collaborative governance have hindered the process. Although the stakeholders have yet to achieve their original goal to implement a DCP for the lower basin, the process offers important learning opportunities for ongoing efforts (Kallis et al., 2009).

Stakeholders will increase the likelihood of success in future DCP efforts by paying careful attention to the design of their collaborations.

Our recommendations for improving collaborative governance for the DCP process are united in some manner by a call for more attention to evaluating the status quo power dynamics involved in inclusion and decision making among the Arizona stakeholders. As the stakeholders attempt to finalize a DCP in 2018–2019 and transition to reconsultation of the 2007 guidelines, this step is essential to improving trust, establishing equitable and accessible conflict resolution mechanisms, and preparing for implementing collaborative policies and goals during windows of opportunity. Improving collaboration among the Arizona DCP stakeholders is an important step in transitioning to adaptive governance, which river basin scholars have argued is one of the most effective forms of governance for handling the social-ecological uncertainty that characterizes the Colorado River basin among others globally (Dore et al., 2012; Gunderson et al., 2016).

Acknowledgements

This material is based upon work supported by the National Science Foundation under Grant No. SES-1462086, DMUU: DCDC III: Transformational Solutions for Urban Water Sustainability Transitions in the Colorado River Basin and the Environmental Resilience Institute, funded by Indiana University's Prepared for Environmental Change grand challenge initiative. Any opinions, findings and conclusions or recommendation expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation (NSF). The authors also wish to thank the anonymous reviewers whose constructive feedback helped greatly improve this manuscript.

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